A.3 cont.

- mixed to color C of the pixel being considered is the color X of that adjacent pixel which adjoins the longest edge, formed by the raster, of the surface portion F_2.

REMARKS

In the Office Action dated December 27, 2001, claims 1 - 4 were rejected under 35 U.S.C. §§ 102 and 103 and claims 5 - 15 were objected to under 37 C.F.R. 1.75(c). In addition, the Office Action presented objections to the drawings and the specification.

Applicant has amended the specification as set forth above to overcome the objections to the specification. Applicant has provided substitute drawings to overcome the objections to the drawings. Applicant has amended claims 4, 5, 7, 8 and 12 - 15 to overcome the objections under 37 C.F.R. 1.75(c). Applicant has also amended informalities in claims 1, 13 and 14. In addition, Applicant has added new claims 16 - 18. Accordingly, claims 1 - 18 are now pending in this application.

Applicant traverses the rejection of claims 1 - 4 under 35 U.S.C. §§ 102 and 103. The cited references, considered either separately or in combination, do not teach or suggest the "application of an edge operator to an image portion for coarsely ascertaining at least one rastered edge configuration" as claimed in the sole independent claim, claim 1. Thus, claims 1 - 4 are not anticipated, nor can they be obvious over the cited art.

In view of the foregoing amendments and the following remarks, reconsideration and withdrawal of the grounds of rejections are respectfully requested.

Examiner's Consideration of the Supplemental Information Disclosure Statement

Applicant notes that the Examiner has not initialed the A. Schilling et al. reference Applicant sent to the USPTO with the Supplemental Information Disclosure Statement filed on January 12, 2000. Applicant requests that Examiner send a copy of the form PTO-1449 initialed to indicate that the

reference has been considered. In the event the Examiner is unable to consider the reference, please contact Applicant's attorney at the telephone number listed below the signature line.

Response to the Objection to the Drawings

The drawings were objected to "because the descriptions in the figures are in a foreign language." According to Applicant's records, drawings with English descriptions were provided with the English translation of the Specification sent to the USPTO on January 12, 2000. However, to expedite consideration of this application, Applicant is hereby submitting a separate copy of these drawings again as substitute drawings. No new matter has been added.

Response to the Examiner's Suggestions Regarding the Arrangement of the Specification

The Examiner noted that the "application is informal in the arrangement of the specification." The specification had been amended as set forth above to add headings and related language where applicable. No new matter has been added.

Response to the Objection to the Specification

The disclosure was objected to because of an informality on page 28, line 3: "the disclosure 'Table 1-3' has no corresponding tables shown." The specification has been amended to correct this typographical error. This sentence now refers to "Tables 1 - 3." No new matter has been added.

Response to the Objection to Claims 5 - 15

Claims 5 - 15 were objected to under 37 C.F.R. 1.75(c) as being in improper form in that certain multiple dependent claims depended on other multiple dependent claims. Claims 4, 5, 7, 8 and 12 - 15 have been amended as set forth above.

Response to the Rejection of Claims 1 - 2 Under 35 U.S.C. § 102

Claims 1 and 2 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Edelson (4,704,605). Referring to column 5, lines 58 - 68, the Office Action states, in part:

> "Edelson discloses a method of eliminating unwanted steps at edges in image representations in the line raster, in particular in on-line operation, characterised by the steps:
>
> a) Application of an edge operator to an image portion for coarsely ascertaining at least one rastered edge configuration (When drawing the edge, the computer is typically moving up to the edge, adding a small increment to the horizontal position of the edge on the previous scan line to calculate the horizontal position of the edge on the new scan line" and as an example, when the pixel number = 32.54, the computer would traditionally decide to use pixel #33.

Applicant respectfully disagrees. The claimed limitation relates to "ascertaining at least one rastered edge configuration." Hence, the edge operator operates on a previously rastered image.

In contrast, the passage in Edelson referenced in the Office Action relating to "drawing the edge" describes the operation of bringing a line into a raster representation. In other words, the referenced process of "drawing the edge" relates to a polygon rendering process wherein the line on the polygon is processed to create a raster representation. The paragraph at column 5, lines 29 - 45 which immediately precedes the quoted passage illustrates that the quoted passage relates to Figures 2 - 5. ("The anti-aliasing performs well along edges which are close to horizontal, as shown in FIGS. 2 and 3. It is also effective in straightening the appearance of edges which are almost vertical as illustrated in FIGS. 4 and 5.") Figures 2 - 5 relate to processing objects (e.g., polygons) to create a rastered representation of a line from the object. See, for example, column 1, lines 28 - 39:

> This bit-mapping practice works well for straight, vertical or horizontal edges, but it is problematical for any other edges. One example of the problem is diagramed in FIG. 2. Pixels labeled A through K represent a portion of one scan line on a display screen. The edge of an object intersects the scan line between pixels C and G. The object body lies below the bold line, in the cross-hatched area. This is referred to as a

> "leading" edge and the edge shown in FIG. 3 is referred to as a "trailing" edge because a CRT beam commonly produces these pixels while moving left-to-right. Thus, the left edge of an object is the first edge of the object that is displayed and the right edge is the second or "trailing" edge of the object.

Accordingly, Applicant submits that independent claim 1 and dependent claim 2 are not anticipated by Edelson.

Response to the Rejection of Claims 3 - 4 Under 35 U.S.C. § 103

Claims 3 and 4, which depend from claim 1 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Edelson (4,704,605) as applied to claim 1, and further in view of Steiner et al. (5,668,940). As foundation for this rejection the Office Action states that "Edelson demonstrated all the elements as applied in the rejection of dependent claim 2." Hence this rejection is predicated on a finding that Edelson teaches all of the elements of claim 1.

As discussed above, Edelson does not teach or suggest the "application of an edge operator to an image portion for coarsely ascertaining at least one rastered edge configuration." Hence, Edelson is not a proper basis for a rejection under section 103. Similarly, Steiner et al. does not teach or suggest the "application of an edge operator to an image portion for coarsely ascertaining at least one rastered edge configuration."

Accordingly, Applicant submits that independent claim 1 and claims 2 - 15 depending on claim 1 are not anticipated by nor obvious in view of Edelson or Steiner et al., either singularly or in combination.

New Claims 16 - 18

New independent claim 16 and dependent claims 17 and 18 include a limitation "ascertaining at least one rastered edge configuration from an image representation to identify pixels which form the

rastered edge configuration or adjoin the rastered edge configuration." This element is not taught or suggested in the cited references. Accordingly, Applicant submits that independent claim 16 and claims 17 and 18 depending on claim 16 are not anticipated by nor obvious in view of Edelson or Steiner et al., either singularly or in combination.

Conclusion

For the foregoing reasons, Applicant submits that claim 1 - 18 are allowable over the cited references. Accordingly, Applicant respectfully requests allowance of the claimed invention.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version with markings to show changes made.**"

Respectfully submitted,

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By _____

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626/795-9900

SDB/cbc

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Please insert beginning at page 1, line 14, the following heading:

FIELD OF THE INVENTION

Please amend the paragraph beginning at page 1, line 15 as follows:

[The invention concerns a method as set forth in the classifying portion of claim 1 and a corresponding apparatus.] The invention relates to computer graphic applications and, more specifically, to anti-aliasing techniques.

Please insert beginning at page 1, line 17, the heading:

BACKGROUND OF THE INVENTION

Please insert beginning at page 11, line 25, the heading:

SUMMARY OF THE INVENTION

Please insert beginning at page 20, line 27, the heading:

BRIEF DESCRIPTION OF THE DRAWINGS

Please amend the paragraph beginning at page 21, line 9, as follows:

Tables 1 through 33, labeled Tab. 1-33 for convenience, show input and output conditions of the circuits, as respectively described in the description.

Please insert beginning at page 21, line 11, the heading:

DETAILED DESCRIPTION OF THE INVENTION

The paragraph beginning on page 28, line 1 has been amended as follows:

All known special cases are brought back to the basic cases insofar as the states ascertained at the end points are converted. That can be seen in greater detail from [Table] Tables 1-3 respectively showing the straight line configurations to be traced in respect of different steps.

In the Claims:

Please amend claims 1, 4, 5, 7, 8 and 12-15 as follows:

1. (Amended) A method of eliminating unwanted steps at edges in image representations in the line raster, in particular in on-line operation, characterized by the steps:

a) [A]application of an edge operator to an image portion for coarsely ascertaining at least one rastered edge configuration,

b) [D]determining the position of at least a first pixel from the amount of those pixels which form the rastered edge configuration or adjoin said rastered edge configuration,

c) [A]approximation of a straight line for ascertaining a probably configuration of the unrastered image edge in the proximity of the first pixel,

d) [A]ascertaining a criterion from the approximation straight line and the position of the first pixel for mixing a color X to the color C in the first pixel considered, and

e) [M]mixing the ascertained color X to the color C in the first pixel considered.

4. (Amended) A method as set forth in [one of the preceding claims] claim 1 characterized in that in the case of a pixel being considered which is not intersected by the approximation straight line, the color remains unchanged.

5. (Amended) A method as set forth in [one of the preceding claims] claim 1 characterized in that in the case of a pixel being considered which is intersected by the approximation straight line the resultant color R is determined in accordance with the following criterion:

the approximation straight line divides the pixel being considered into two surface portions F_1, F_2, wherein $F_1 + F_2 = 1$, with 1 being the total area of the pixel, wherein F_1 is that surface portion in which the pixel center point lies:

- mixed to color C of the pixel being considered is the color X of that adjacent pixel which adjoins the longest edge, formed by the raster, of the surface portion F_2.

7. (Amended) A method as set forth in claim 5 [or claim 6] characterized in that the surface portions F_1, F_2 are approximated by a suitable approximation process.

8. (Amended) A method as set forth in [one of the preceding claims] claim 1 characterized in that said method steps are applied to an image portion treated by means of rendering and/or a shading process.

12. (Amended) A method as set forth [in one of the preceding claims] claim 1 characterized in that the processing is effected in time-displaced relationship in a frame buffer without further intermediate storage.

13. (Amended) A method as set forth in [one of the preceding claims] claim 1 characterized in that the approximation straight line passes over a plurality of steps of the rastered edge configuration and that the approximation straight line ends when the criteria

1) [T]there can occur a maximum of two different step lengths, the step lengths of which may also differ by a maximum of 1[.],
2) [O]only one of the two step lengths may occur a plurality of times in succession[.],
3) [T]the sequential arrangement of the numbers of the steps which are of the same length gives a number sequence in which there is alternately always a one and then any number (>0). The ones (only those at each second position) are deleted from that sequence. In the sequence obtained only two different numbers which differ by one may again occur[.],

4) [I]in the sequence obtained in 3, only one of the two possible numbers may occur a plurality of times in succession[.],

5) [B]by repeatedly applying rules 3, and 4, to the number sequence, it is possible to obtain an ever more global view onto the edge,

are checked in rising succession and at least one criterion is not fulfilled.

14. (Amended) A method as set forth in [one of claims 1 through 13] claim 1 characterized in that the approximation straight line passes over a plurality of steps of the rastered edge configuration and that the approximation straight line ends when one of the criteria

1) [T]there can occur a maximum of two different step lengths, the step lengths of which may also differ by a maximum of 1[.],

2) [O]only one of the two step lengths may occur a plurality of times in succession[.],

3) [T]the sequential arrangement of the numbers of the steps which are of the same length gives a number sequence in which there is alternately always a one and then any n umber (›0). The ones (only those at each second position) are deleted from that sequence. In the sequence obtained only two different numbers which differ by one may again occur[.],

4) [I]in the sequence obtained in 3, only one of the two possible numbers may occur a plurality of times in succession[.],

or one of the criteria 1), 2), 3) or one of the criteria 1), 2) is not fulfilled.

15. (Amended) A method as set forth in [one of the preceding claims] claim 1 characterized by the provision of a triple buffer, wherein the three resulting buffers share in cyclic interchange in parallel relationship the method steps of rendering post-anti-aliasing and image reproduction.